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OFDM RECEIVER WITH ADAPTIVE EQUALISER

This invention relates to a receiver, and in particular to an OFDM receiver, and to an adaptive equalizer for use in such a receiver and to a method of training the equalizer.

The European digital terrestrial television standard, DVB-T, specifies orthogonal frequency division multiplexing, OFDM as the modulation scheme.

In conventional OFDM systems, multipath radio transmission channels cause delay spread distortion of the transmitted signal. Although adaptive equalizers can be used in many applications to cancel out delay spread distortion, existing designs for OFDM receivers and adaptive equalizers are generally incompatible, although it has been proposed to use a number of equalizers acting in parallel on respective sub-bands of the OFDM signal.

Therefore, existing designs for OFDM systems employ guard intervals to combat the effects of delay spread. Each transmission period includes a period during which useful information is transmitted, and a guard interval, during which no useful information is transmitted. Thus, use of a guard interval reduces efficiency of the transmission, and less data can be transmitted within a given radio frequency bandwidth.

The present invention relates to an OFDM receiver including an adaptive equalizer, which attempts to overcome the incompatibility of existing designs of OFDM receivers and adaptive equalizers.

According to a first aspect of the present invention, there is therefore provided a receiver as defined in claim 1.

According to a second aspect of the present invention, there is ~~therefore~~ provided an equalizer as defined in claim 6.

~~According to a third aspect of the present invention, there is therefore provided a method as defined in claim 7.~~

5 For a better understanding of the present invention, reference will now be made to the accompanying drawings, in which:-

Figure 1 shows a first receiver in accordance with the invention;

10 Figure 2 shows a first equalizer in accordance with the invention;

Figure 3 shows a second equalizer in accordance with the invention;

15 Figure 4 shows a second receiver in accordance with the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

As Shown in Figure 1, a transmitted analog OFDM symbol is received over a radio frequency channel 2 having unknown and time-varying characteristics, and is subject to the addition of noise.

20 The receiver therefore takes an input signal $y_1'(t)$ in an input device 4, where it is demodulated, A-D converted and down-sampled to give a time domain vector $y'(n,1)$. The received sequence $y'(n,1)$ is filtered by an adaptive equalizer 6 to produce a time-domain sequence $z'(n,1)$.

25 The time domain sequence output from the equalizing filter 6 is input to a guard extraction device 8 to form an output $z(n,1)$. An advantage of the present invention is that the need for a guard interval may be reduced or eliminated. The guard extraction device 8 is therefore required only if it is needed if a guard interval is used by the transmitter which is in use.

30 A Fast Fourier Transform (FFT) 10 is then applied to $z(n,1)$ to produce a frequency domain vector $Z(k,1)$.

In this embodiment of the invention, the frequency